Electro-optical Cellulose based Liquid Crystal light shutters

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Cellulose derivatives composites for electro-optical application were introduced in 1982 by Craighead and co-workers [1] followed a few years later by the development of a new type of cellulose derivative electro-optical cell referred to as cellulose based polymer dispersed liquid crystal (CPDLC) [2,3].
In opposition to the early Polymer dispersed Liquid Crystal (PDLC) systems, where the liquid crystal component was phase separated out of the polymer matrix forming droplets uniformly distributed in the matrix, the basic optical cell of a cellulose derivative composite referred to as CPDLC, was formed by a rough cellulose derivative polymeric film surrounded by two nematic liquid crystal layers and the set placed in between two transparent conducting rigid or flexible substrates.
These cells had very challenging properties, presenting high transmission coefficients values (around 0.8), but suffering from rather high turn on voltages (around 1,5V/μm) [4,5].
We present light scattering electro-optical devices where layers of two different cellulose derivatives were deposited as nanofibers directly onto the conductive substrates by electrospinning. These devices can be used as shutters or as privacy windows since they can be electrically controlled to scatter light (OFF state) or to be transparent (ON state) [6]. This new system presents very challenging electro-optical properties, since they have very high transmission coefficients in the ON state, low transmission coefficients in the OFF state, and low turn on voltages.

References

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